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U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

Allegheny Forest Experiment Station
Philadelphia, Pennsylvania

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Technical Note No. 3

LITTER COVER AND SOIL SURFACE TEMPERATURES, OAK-PINE TYPE

The range in soil surface temperature has frequently been measured under different types of forest stands and under varying conditions of ground cover because of the general recognition that high surface temperatures may prevent germination or cause the early death of tree seedlings. The following data, collected in southern New Jersey under an 80-year old stand of oak and pine, show to what extent high temperatures are ameliorated by the presence of leaf litter.

"Gooseneck" maximum thermometers were placed on the surface of the soil after the natural vegetation had been removed by spading and raking. One thermometer was left without cover, the second was covered with oak leaves and the third was covered with a layer of a black commercial mulch paper. To minimize the effect of variation in tree shade, the mulches were shifted at intervals so that each thermometer was successively exposed to all three of the conditions. The thermometers were read daily from July 5 until September 17, 1932, this period being broken into four intervals when the soil coverings were changed. The results of these readings appear below:

Period	Mean maximum soil surface temperature			Mean maximum air temperature	Rainfall
	Under paper	Under leaves	On exposed soil		
	Degrees, Fahrenheit			Degrees F.	Inches
7/ 5-7/21	99.8	79.0	101.7	85.3	0.88
7/22-8/9	96.6	82.9	96.5	84.3	3.16
8/10-8/29	90.7	83.0	102.6	83.3	1.29
8/30-9/17	76.6	77.1	82.6	80.0	2.76
Averages	90.9	80.6	96.1	83.2	

The highest temperature recorded for the entire period, 119 degrees, was on the exposed soil. The same day, the temperature under the paper was 114 degrees, also the highest for the period. The temperature under the leaves for this particular day was only 80 although a temperature of 91 was recorded later on a day when the maxima under the paper and on the exposed soil were not unusually high. As is indicated in the table, there is no direct relation between air temperature and the temperature of the soil surface. There is however a distinct relationship between the moisture content of the surface soil and its temperature. As the soil surface drys, other conditions remaining the same, the soil surface temperature will increase.

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